

WHAT IS CLAIMED IS:

1. A high-frequency amplifier connectable to a non-reciprocal circuit element having an input impedance lower than an output impedance, comprising:

a substrate;

5 an amplifier element provided on said substrate for receiving and amplifying an input signal;

a harmonic processing circuit provided on said substrate for matching of harmonics included in an output signal from said amplifier element; and

10 a filter element provided on said substrate to receive an output from said harmonic processing circuit for selectively passing a signal to be supplied to said non-reciprocal circuit element by using a predetermined frequency as a cutoff frequency.

2. The high-frequency amplifier according to claim 1, wherein said filter element includes:

an inductor arranged on a signal line extending from an output of said harmonic processing circuit to said non-reciprocal circuit element;

5 a first capacitor arranged on said signal line and between a first node on an input side of said inductor and ground; and

a second capacitor arranged on said signal line and between a second node on an output side of said inductor and said ground.

3. The high-frequency amplifier according to claim 1, wherein the output impedance of said non-reciprocal circuit element is substantially 50 ohm, and

5 an output impedance of said high-frequency amplifier and the input impedance of said non-reciprocal circuit element are substantially in the range of 3 ohm to 30 ohm.

4. The high-frequency amplifier according to claim 1, wherein

first and second via holes are formed in said substrate for connection of a front side of said substrate with a ground electrode provided on a rear side of said substrate,

5 said high-frequency amplifier further comprises said ground electrode, and

said filter element includes:

10 a first signal line provided on said substrate to extend from an output of said harmonic processing circuit to said non-reciprocal circuit element;

an inductor arranged on said first signal line;

a second signal line provided on said first signal line to extend from a first node on an input side of said inductor to said ground electrode via said first via hole;

15 a first capacitor provided in said second signal line on said substrate;

a third signal line provided on said first signal line to extend from a second node on an output side of said inductor to said ground electrode via said second via hole; and

20 a second capacitor provided in said third signal line on said substrate.

5. The high-frequency amplifier according to claim 1, wherein said amplifier element amplifies a fundamental frequency represented by  $f_0$  and said predetermined frequency represented by  $f_c$  satisfies a relation of  $f_0 < f_c < 2f_0$ .

6. A radio transmission device for supplying a high-frequency signal, comprising:

an amplifier element for receiving and amplifying an input signal;

a substrate having said amplifier element arranged thereon;

5 a harmonic processing circuit provided on said substrate for matching of harmonics included in an output signal from said amplifier element;

a filter element having at least its part provided on said substrate to

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10 receive an output from said harmonic processing circuit for selectively  
passing the output by using a predetermined frequency as a cutoff  
frequency;

a first transmission line for transmitting the output from said filter  
element; and

15 a non-reciprocal circuit element receiving a signal from said  
transmission line for non-reciprocally transmitting the signal in the  
direction in which the signal is transmitted from said transmission line, said  
non-reciprocal circuit element having an input impedance lower than an  
output impedance.

7. The radio transmission device according to claim 6, wherein  
said filter element includes:

5 an inductor provided on said substrate and arranged on a signal line  
extending from an output of said harmonic processing circuit to said first  
transmission line;

a first capacitor provided on said substrate and arranged on said  
signal line and between a first node on an input side of said inductor and  
ground; and

10 a second capacitor provided on said substrate and arranged on said  
signal line and between a second node on an output side of said inductor and  
said ground.

8. The radio transmission device according to claim 6, wherein  
said filter element includes:

5 a first capacitor provided on said substrate and arranged between  
ground and a first node on a signal line extending from an output of said  
harmonic processing circuit to said first transmission line;

an inductor provided outside said substrate and arranged on said  
signal line at a part of said signal line extending from said first node to said  
first transmission line; and

10 a second capacitor provided outside said substrate and arranged on  
said signal line and between a second node on an output side of said

inductor and said ground.

9. The radio transmission device according to claim 6, wherein said filter element includes:

5 a first capacitor provided on said substrate and arranged between ground and a first node on a signal line extending from an output of said harmonic processing circuit to said first transmission line;

a second transmission line provided outside said substrate and arranged on said signal line at a part of said signal line extending from said first node to said first transmission line; and

10 a second capacitor provided outside said substrate and arranged on said signal line and between a second node on an output side of said second transmission line and said ground.

10. The radio transmission device according to claim 6, wherein the output impedance of said non-reciprocal circuit element is substantially 50 ohm, and

5 the input impedance of said non-reciprocal circuit element is substantially in the range of 3 ohm to 30 ohm.

11. The radio transmission device according to claim 6, wherein first and second via holes are formed in said substrate for connection of a front side of said substrate with a ground electrode provided on a rear side of said substrate,

5 said radio transmission device further comprises said ground electrode, and

said filter element includes:

10 a first signal line provided on said substrate to extend from an output of said harmonic processing circuit to said non-reciprocal circuit element;

an inductor arranged on said first signal line;

a second signal line provided on said first signal line to extend from a first node on an input side of said inductor to said ground electrode via

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said first via hole;

15        a first capacitor provided in said second signal line on said substrate;  
         a third signal line provided on said first signal line to extend from a  
second node on an output side of said inductor to said ground electrode via  
said second via hole; and

20        a second capacitor provided in said third signal line on said  
substrate.

12. The radio transmission device according to claim 6, wherein  
said amplifier element amplifies a fundamental frequency  
represented by  $f_0$  and said predetermined frequency represented by  $f_c$   
satisfies a relation of  $f_0 < f_c < 2f_0$ .